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**Avoiding Lessons Re-Learned In Collaboration Experimentation**

**James W. Broyles, LorRaine Duffy, Cheryl D. Putnam, & Linda Dunham**

Space and Naval Warfare Systems Center, San Diego

53560 Hull Street

San Diego, CA 92152-5001

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### **Abstract**

Collaboration experimentation in the Department of Defense (DoD) has rapidly grown over the past few decades. This fact has been highlighted by the emergence of several collaboration systems and tool suites used among various communities within the DoD. Some of the collaboration products available today include the Defense Collaboration Tool Suite (DCTS), InfoWorkSpace (IWS), and Groove. Over the last five to ten years, the authors at one Navy laboratory have had the opportunity to work together, either independently or in small 2 to 3-person teams, on various stages of the research process for several Navy, Marine Corps, and Joint projects exploring collaboration. These projects often conducted experiments on problem sets framed in a variety of Command and Control scenarios with real warfighters using different collaboration systems and tool suites. From the authors' experiences they have discerned several re-occurring themes (suitable for lessons learned) that have evolved a practical set of guidelines for making collaboration in experiments a more rewarding and humanizing experience for the participants. The sharing of these observations and practices with other researchers and organizations in their exploration of collaboration may help them to avoid the relearning of collaboration lessons learned.

### **Introduction**

Research and experimentation on collaboration in the Department of Defense (DoD) has grown rapidly over the past few decades. Early collaboration research efforts focused on building collaborative environments that used familiar metaphors such as people meeting at a table, in a room or workspace (e.g., Odyssey). Interest on how people can effectively collaborate across time and space to facilitate the sharing of critical information and shortening of the decision making process has resulted in several Joint, Service-wide, and Laboratory-based experiments. These experiments explored collaboration to support the Command and Control (C2) needs of today's warfighters using commercially available products such as the Defense Collaboration Tool Suite (DCTS), InfoWorkSpace (IWS), and Groove, to name a few. In fact, several of these collaboration systems and tool suites are used among various communities within the DoD.

Command and control requires the efficient and effective sharing of critical information and collaboration among warfighters and commands that are typically in distributed locations across the battle space. Much has been learned about the process of collaboration through observation and participation in these events. Some of these observations become lessons learned and are added to the research's team knowledge and practical experiences. Others are left to be experienced again and again (namely, lessons relearned) and are never resolved nor fully reported. For example, how individuals' best share information among team members, or prepare themselves to undertake collaborative pursuits while using new tools or newly acquired procedures in distributed locations are often not the focus of the research. This failure to report is a shortcoming in how we share our knowledge of how people collaborate, and is especially aggravated in separately conducted experiments that use different collaboration systems or tool sets.

This knowledge could be useful in assessing the benefits of collaboration in C2 but typically resides with the participants and researchers conducting the experiments.

Over the past five to ten years, the authors at one Navy laboratory have had the opportunity to work either together, independently or in small teams, on several Navy, Marine Corps, and Joint projects exploring collaboration. The projects often conducted experiments framed in a variety of C2 scenarios and problem sets with real warfighters using different collaboration systems and tool suites. The authors participated in various stages of the research and experimentation process; namely from idea generation and proposal writing, to design of experiments, assisting with the set up and installation of collaboration systems and networks, testing of collaboration hardware and software, training of participants, to conducting assessments and report writing. From these experiences the authors have discerned several re-occurring themes (i.e., some findings suitable for lessons learned) that have evolved into a practical set of guidelines or recommended procedures for making collaboration in experiments a more rewarding and humanizing experience for the participants. The sharing of these observations and practices with other researchers and organizations in their exploration of collaboration may help them to avoid the relearning of collaboration lessons learned.

The themes we have observed have occurred throughout the different stages of the research process and have been re-observed in several different collaboration venues and events. Many of the themes are not earth shattering or new. Most represent useful tips or observed best practices in the planning, design, training, hardware set-up and integration, software testing, data collection, and assessment areas for a collaboration experiment. The importance of training, for example, is one re-occurring theme. Collaboration researchers need to make training an integral part of their experiment's preparation. Training influences both the time and efforts spent in the preparation of meaningful materials as well as ensuring that you have well-prepared participants, with the appropriate skill levels, for your collaboration event. Both areas are important for success of your experiment. Other themes we have observed come from the set-up and integration of collaboration tools, testing of hardware and software, preparation of participants, participant drain or lost of trained participants over time, and key actions to enhance collaboration within a collaborative session.

### **Recommended Best Practices**

The authors' experiences are synthesized and described as a practical set of recommendations and guidelines.

- Planning. Some times our experimental plans and strategies for a large-scale collaboration event or multiple uses of collaboration tools are too complicate in design, objectives, and approach. Recommend experimenters keep their experimental design simple and meaningful.
- Training. Several related areas are described.
  - Take your training program on the road to your participants by holding on-site sessions using a small WAN or reach them through internet access.

- Provide your participants with a 3-tier approach to collaboration training. First, allow them opportunities to practice becoming proficient in the use of the different features and tools. Second give them information on how the collaboration tools can help them with anticipated tasks or assignments. Third, help publish a doctrine highlighting how their organization supports the collaboration among its members (command acceptance).
- Encourage use of non-work problem solving to help participants learn to use the collaboration tools. Recommend conducting a Collaboration Olympics (e.g., find-a-friend - where's Waldo, locate key pieces of information relays) or a build a sample presentation as useful training drills.
- Trainers are tremendous resources and can be effectively used in several areas of your experiment. As part of your training team, they can listen to comments and questions from participants-in-training and be able to relay these issues to the experiment team for resolution. In the data collection and assessment phases the trainers are excellent points of contact for the participants and data collectors.
- Participants.
  - Expect the loss of some trained participants in your collaboration event because of various legitimate reasons (e.g., change of personnel, duty, travel, or leave, etc.). Be prepared to offer refresher training or additional practice sessions to bring the new participants up-to-speed.
  - Make opportunities to practice collaborating together either at their respective commands or ensure web-based opportunities.
  - It usually takes as long as time is available for participants to complete a collaboration task. Time management is important. Awareness of time during a collaborative session should be a responsibility of all participants.
- Set-up, Testing, and Integration. There is never enough time to test or work out installation problems, de-bug the software or correct hardware inefficiencies.
  - There are issues with stability and scalability, especially in experiments with a large number of users. It has been our observations that not until the actual event do you get the appropriate number of participants and system loads that can adversely impact how your collaboration services and network operations. Be prepared to respond to these stressors.
  - Interoperability across some collaboration tools can be spotty at times. Continue to test as much of the set up as possible before the event.
- Improving the collaborative process.
  - Develop a working concept of operations for your collaboration system and tools.
  - Business rules or standard operating procedures (SOPs) are critical for effective collaboration. SOPs must be clearly stated. At a minimum, the business rules must cover agreed-upon concepts of operations, user roles, dynamic re-tasking procedures, and recovery strategies. Ensure the SOPs are read, understood and accepted by all your participants. If business

- rules need to be change, recommend taking immediately action to revise them.
- Having a co-lead who helps the leader facilitate the virtual meeting pays big dividends for the leader and team members alike. A meeting facilitator can enhance information exchange among participants and the coordination of tasks between teams.
  - Recording of decisions made in virtual collaboration sessions. Ensure collaboration decisions are documented (hard copy or posted on the web) for those in the sessions as well as for those not attending.
  - Do not neglect the importance of face-to-face collaboration and other helpful tools such as telephones, fax machines, or pagers, especially in distributed sites.
- Data Collection. Collect meaningful data, such as frequency of use of individual collaboration tools across tasks, information produced by the different tools, and when the collaboration feature was useful or how did it help the users accomplish their task or mission.
    - Encourage the collection of technical or system data from the beginning of participant's interaction with their collaboration tools, or as so as technically possible. Also recommend tracking and monitoring your participants' use of collaboration tools with such tools as Web Trends, or other spy ware type-programs.
    - It is important to know what your participants are doing in each segment of your experiment.
    - Use storylines or scenario segments to highlight the use of different collaboration features and tools.
  - Assessment purposes. Make your data count.
    - Best location to observe participants in collaboration is in-person and as part of their immediate physical team. You tend to lose more specifics of individual behavior the more physically removed you are from your participants.
    - Paced the participants' use of collaboration tools at the beginning so they do not become overwhelm with all the possibilities of tool use.
    - Try to use their collaborative interactions as the focus of your assessment.
    - Choose user or customer-focused metrics. Allow for multiple assessment snapshots.
    - Be firm in getting all your surveys or data collection forms completed.
    - Collect generic measures across different collaboration systems & tools.
    - Gear your assessment process from your participant's perspectives
    - Automate the process as much as possible. Get results back to participants as soon as possible to allow them to be part of the evaluation process.
    - Understand your users and their proficiency using your collaboration tools Styles, preferences, and proficiencies for collaboration can vary across participants. Many authors provide user descriptive terms to reflect the level of their participants' expertise (either, beginner, immediate user, or advanced / expert user may be helpful to distinguish individual skill levels).

- **Report Writing.** Reports tend to take too long of time to provide results and conclusions to your participants. Recommend reporting more practical observations and findings by posting results on a web-site or home page. Explore better ways to show management your results with color-coded results or providing survey and participant data summaries.

The authors have also made several key observations about how individuals and teams interact in a collaborative information environment. Some examples of what helps humans collaborate as well as what hinders their progress are described below.

The collaborative style and leadership contributions of a leader of a collaboration session are critical to the progress that the team makes. Different leadership styles tend to reap different results (for example, a facilitator versus a screamer). The leaders who encourage their team to be open to new ideas or courses of actions during discussion periods and show an interest to hear from the senior as well as most junior team members tend to better control the pace of the meeting and facilitate the exchange of information among collaborative team members. At times, a leader must hold his/her staff to a higher standard than they are performing in order to get what information or recommendations the leader wants to get from his team. However, leaders must remember the old adage to praise in public and discipline in private. Collaboration is a public event, and one of the best ways to muzzle input from your team members is by having a leader openly criticize or discipline someone while the rest of the team experiences it too in the collaborative session.

Individuals need to feel comfortable with the operation and capabilities of collaboration system and tools before they are required to perform with them. Most new collaboration users often benefit from receiving a quick review or refresher training. In addition, allowing users to do small, non-work type tasks helps them to become more familiarized with all the features and tools of a collaboration system. Some examples of helpful warm-up tasks may include finding someone or a piece of information on the collaborative network via one of the tools. Conducting practice sessions that have the users involved in sharing of information across the different collaboration tools (namely, Instant messaging, text chat, audio and video exchanges, and whiteboard) before the experimental task begins is a natural for getting them ready and comfortable. Relay races of information among different teams or groups of users or having them perform a scavenger hunt for key information or persons with specific expertise are helpful. Keep the focus on tool use and not how well the individual is completing the task. Do drills and allow for short refresher training. Keeping the fear of failure expectation low encourages more spontaneity in the collaborative behavior. Role-playing is another way to break the ice.

Individuals typically want to know whom they are collaborating with in a collaborative session. This is especially true for new individuals to an established group or when you have several teams collaborating across different commands or sites together. There has not been enough effort done in gathering and displaying routine information about other session members in a collaborative environment. Basic user profile information of who

you are, your job title, rank, and command and experience could easily be gathered at the start or registration period of an exercise, experiment or event. This information could be reviewed when needed by others involved in a collaboration session. The ability to display just-enough personal biographical information about each of collaboration team members should help users become better acquainted with the individuals who are participating. Usually collaboration users will quickly learn who is talking by being able to distinguish different collaborators by the sound of their voices. If video is available, this is helpful too.

Other things that tend to help collaborations are pagers, cell phones and self-help note cards. Many new participants in a collaboration session are more comfortable using a short “cheat sheet” or a list of steps as they must perform than relying on their memory or assistance from others.

Understanding and humanizing the collaboration process in experimentation is a worthwhile goal. The time and energies expended in this endeavor at the beginning of and during a collaborative event will result in more productive and meaningful findings.

### **Future Research**

Brown and Duguid, (2000) provide provocative insights of human behavior with how humans learn, interact and share information with each other in their book, entitled *Social Life of Information*. Many of their findings could be easily applied to improving collaboration within an information environment.

There are several other areas worthy of further exploration. The study of teenagers’ collaboration habits and practices, vertical (senior to subordinates) versus horizontal (peer) collaboration environments, and the differences of information producers versus consumers appear rich in substance and context

In addition, there are several research areas we believe warrant additional investigation within the collaborative environment. The areas include:

- Information richness (Daft & Lengel, 1984)
- Sharing of Private vs. Public Information (Stasser & Titus, 1985, 1987)
- Cognitive-based guidelines for effective use of collaboration tools (Noble, 2002)
- Research opportunities on the Internet (Gosling, Vazire, Srivastava, & John, 2004)

In this paper the authors have addressed several of their key observations about how individuals and teams collaborate in a collaborative information environment. An attempt was made to help identify what helps humans collaborate as well as hinder their process. Various issues about the experimentation methodology, training of participants for experiments with different collaboration systems, and assessment processes were discussed. The best practices from their experiences are provided as a practical set of recommendations and guidelines. Understanding the collaboration goals of your



participants and humanizing the collaboration process for them are extremely important contributions that researchers can undertake in their exploration of collaboration.

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# Avoiding Lessons Relearned in Collaboration Experimentation

James W. Broyles, LorRaine Duffy,  
Cheryl Putnam and Linda Dunham

Space Warfare Systems Center San Diego

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# Agenda

- Background
- Participation in Experiments
- Problem
- Presentation Goal: Observations & Experiences
- Avoiding Lessons Re-learned
  - Training
  - Documentation, Business Rules & Processes
  - Test & Integration
  - Users & Participation
  - Data Collection & Analysis
- Conclusions
- Future Ideas

# Background

- Collaboration research & experimentation in Department of Defense (DoD) has grown rapidly since the late 1990's
- Emergence of several collaboration systems & tool suites used among various communities within DoD
- Interest in how people effectively collaborate, share critical information, & facilitate the decision-making process across time and space has results in the conduct of several Joint, Navy, & Marine Corps experiments

# Experiments

- Joint Forces Command's (JFCOM) Experiments
  - Millennium Challenge 2000 & 2002
  - Unified Vision 2001
  - Limited Objectives Experiments
- USMC's Hunter Warrior & Capable Warrior
- Extending the Littoral Battlespace (ELB)
- CINC 21 – DCTS deployment / evaluation
- Joint Warrior Interoperability Demonstration (JWID) 95, 96, & 97
- Tactical Decision Making Under Stress (TADMUS 91)

# Problem Space

- From authors' experiences & observations:
  - Discerned several re-occurring themes suitable for Lessons Learned
  - Similarity of collaboration experiences from users in both small and large scale venues
  - Several themes continue to be repeated

# Presentation Goal

- Avoiding Lessons Re-learned in:
  - Training
  - Documentation, Business Rules & Processes
  - Test & Integration
  - Users' Participation
  - Data Collection & Analysis
- Sharing these insights and best practices may help others to avoid the relearning of collaboration lessons already learned by others

# Training

- Collaboration researchers need to make training an integral part of their experiment's preparation
- Encourage 3-tier approach
  - Establish a climate for repeated practice opportunities for users to develop proficient use of the tools
  - Inform how tools will help with anticipated tasks & assignments
  - Forge an organizational commitment to collaboration processes and business rules
- Trainers are valuable resources
  - Help provide the first glance of user acceptance & user problems
- Encourage user buy in with non-task specific problem sets



# Documentation

- Business rules and processes are critical for effective and efficient collaboration
- Standard operating procedures (SOPs) and Business rules need to be published
  - Ensure users read, understand, and accept as their own
  - If a business rule needs to be changed to accommodate your users, recommend taking immediate action to revise it
- Recording of collaboration sessions
- Documenting of decisions made in virtual sessions
  - Ensure collaboration decisions are documented (hard copy or posted on a web site) for those attending as well as those not attending

# Test & Integration

- Never enough time to test or work out installation problems, software bugs, or hardware and software inefficiencies
- Include your network engineer & system administrator in planning and maintenance is imperative
  - Collaboration systems require healthy networks
  - Maintaining them is no small matter
- We have found that using network engineers and computer programmers (for appropriate level trouble-shooting) guarantees a more efficient process

# Users & Participation

- Expect the loss of some trained users for your event
- Be prepare to offer refresher training or practice sessions to help bring new users to up-to-speed
- Make opportunities for practice collaboration sessions among users at home organizations or web-based events
- Users typically experience a rapid 3-4 day learning curve at start of event for various reasons
- Humanize the collaboration process with games and practice sessions

# Data Collection & Analysis

- Easy question generation & survey construction methods are desired
  - Hang as favorites on web site
- Recommend automated data collection methods & display of scored data
- Access to on-line surveys with real-time ability to display group or individual results has tremendous value to both collaboration team and users
- Recommend survey results & data analyses be available 24/7 to all with one button access facilitate understanding of report findings.

# Conclusions

- Avoid the relearning of lessons learned for every collaboration experience
- Understand your users (needs and goals)
- Encourage users to help evaluate their performance
- Humanizing the collaboration process in experimentation is a worthwhile goal
- Time and energies spent for these efforts will result in more productive and meaningful findings

# Future Ideas

- Exploring insights of human behavior with how humans learn, interact, & share information (Brown & Duguid, 2000)
  - Especially the social contribution of learning, networks, communities of practice & sharing knowledge.
- Other promising areas warrant additional study in light of what we know today
  - Information richness (Daft & Lengel, 1984)
  - Sharing of public and private information (Stasser & Titus, 1985, 1987)
  - Individual vs. team cognitive measures (Evidence Based Research, 2000)